Analysis of Plant Remains from the Western Carolina Regional Airport Site

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Introduction

Archaeological plant assemblages represent only a small fraction of what was originally used and deposited by humans in open-air settings. Natural and cultural factors can significantly modify organic remains, resulting in recovered assemblages that differ dramatically from the original deposits. As archaeologists, we examine collections that have undergone a series of processes—from the original selection of plants and animals by humans, to food preparation, cooking, discard, animal and insect scavenging, burial, decay, and weathering, to the recovery of food residues by archaeologists. Using standard methodological procedures for sampling, quantification, and analysis allows us to make sense of our assemblages in spite of the deleterious effects of these processes. Here we report on the identification and analysis of four archaeobotanical samples from the Western Carolina Regional Airport site in Andrews, NC. Only basic results are discussed; due to a limited number of samples, no quantitative analysis was conducted.

Recovery and Preservation Bias

The circumstances under which plants preserve best archaeologically involve extreme conditions (e.g., exceptionally wet, dry, or cold environments) that prohibit decomposition of organic matter (Miksicek 1987). Plants can also preserve through exposure to fire, which can transform plant material from organic matter into carbon (Miksicek 1987). The likelihood that a plant will become carbonized varies according to the type of plant, how it is prepared and used, and whether it has a dense or fragile structure (Scarry 1986). Plants that are eaten whole are less likely to produce discarded portions that may find their way into a fire. Plants that require the removal of inedible portions (e.g., hickory nutshell, corn cobs) are more likely to find their way into a fire, and thus into the archaeological record. Inedible plant parts represent intentional discard that is often burned as fuel. Moreover, because inedible portions tend to be dense and fibrous, they are more likely to survive the process of carbonization than the edible parts (e.g., hickory nutshell vs. nutmeats). Physical characteristics are also important for determining whether or not a plant will survive a fire. Thick, dense nutshells are more likely to survive a fire than smaller, more fragile grass seeds. Food preparation activities also affect potential plant carbonization. The simple process of cooking provides the opportunity for carbonization through cooking accidents. Foods that are conventionally eaten raw, however, are less likely to be deposited in fires than cooked foods.
Some plants that find their way into the archaeological record in carbonized form were not eaten at all. Wood fuel is the most obvious example. Burned house structures can also yield carbonized plant deposits, and these deposits often differ dramatically from refuse deposits (Scarry 1986).

While we cannot ever hope to know the absolute quantities or importance of different plants in any past subsistence economy, the preservation and recovery biases discussed above do not prohibit quantitative analyses of archaeobotanical assemblages. The most commonly used plant resources in any subsistence economy are more likely to be subject to activities that result in carbonization (e.g., through fuel use and accidental burning) and ultimately, deposition (Scarry 1986; Yarnell 1982). Thus, we can quantitatively examine the relative importance of commonly used plant resources through time and across space.

Laboratory Procedures

A total of four flotation samples from the Western Carolina Regional Airport site from two features were collected and analyzed, representing a total of 44 liters of soil with a total plant weight of 37.59 grams. Both the light and heavy fractions of the flotation samples were analyzed. Although the materials from the light and heavy fractions were processed and sorted separately, data from the two fractions were combined for presentation. According to standard practice, the light fractions were weighed and then sifted through 2.0 mm, 1.4 mm, and 0.7 mm standard geological sieves. Carbonized plant remains from both fractions were sorted in entirety down to the 2.0 mm sieve size with the aid of a stereoscopic microscope (10–40 X). Residue less than 2.0 mm in size was scanned for seeds, which were removed and counted; in addition, taxa encountered in the 1.4 mm sieve that were not identified from the 2.0 mm sieve were also removed, counted, and weighed. Acorn nutshell was also collected from the 1.4 mm sieve as this tends to fragment into smaller pieces and can be underrepresented in the 2.0 mm sieve. Botanical materials were identified with reference to the paleoethnobotanical comparative collection at the University of California, Santa Barbara (UCSB) paleoethnobotany lab, various seed identification manuals (Martin and Barkley 1961; Delorit 1970), the USDA pictorial website (http://www.ars-grin.gov/npgs/images/sbml/), and Minnis (2003) which allowed us to identify the range of taxa native to the region. All plant specimens were identified to the lowest possible taxonomic level. Taxonomic identification was not always possible—some plant specimens lacked diagnostic features altogether or were too highly fragmented. As a result, these specimens were classified as "unidentified" or "unidentified seed." In other cases, probable identifications were made—for example, if a specimen closely resembled a sunflower seed, but a clear taxonomic distinction was not possible (e.g., the specimen was highly fragmented), then the specimen was identified as probable sunflower and recorded as "*Helianthus* cf.".

Once the plant specimens were sorted and identified, we recorded counts, weights (in grams), portion of plant if relevant (e.g., acorn nutshell versus nutmeat), and provenience information. Wood was weighed but not counted, and no wood identification was conducted. Generally, most of the seeds identified in the samples were too small to weigh, and thus only counts were recorded. Other than counts and weights, no other measurements were taken on any specimens.

Basic Results

Table 1 lists the common and taxonomic names of all identified species. Raw counts and weights are provided for each taxon; plant weight and wood weight are also provided. Combined, these samples yielded 12 plant taxa (identified to the Genus level).

Corn (*Zea mays*), bean (*Phaseolus* sp.), and squash/bottle gourd rind (*Cucurbita* sp) were the only definitive field cultigens present in the samples. Corn and beans are often discussed together as they commonly represent partner crops. Whether or not they co-evolved as part and parcel of the same domestication process, corn and beans have a long tradition of inter-cropping and successional cropping in the New World (Lentz

2000). Inter-cropping corn and beans is often beneficial in that corn stalks support the bean vines throughout plant growth (Smartt 1988:149). Moreover, inter-cropping also reduces the risk of pest and disease outbreaks than in pure stands (Smartt 1988:149). Corn and beans are also complementary in terms of nutritional value; corn is deficient in essential amino acids lysine and isoleucine, which beans have in abundance (Bodwell 1987:264; Giller 2001:140). Thus, in addition to the benefits of cropping corn and beans together, there are also benefits to eating corn and beans together. Bottle gourd fruit, seeds, oil and leaves are edible and the gourds are easy to grow. The rinds can also be hollowed out for storage of water and other substances.

Acorn (*Quercus* sp.) and hickory (*Carya* sp.) were the only nuts recovered from the flotation samples, consisting entirely of nutshell remains with the exception of a possible acorn meat fragment. Hickory nuts and some acorns require extensive processing before they are rendered palatable (Petruso and Wickens 1984). The hickory kernels are so tightly enmeshed in the interior shell that picking the nutshells from the cracked shell casing is a time-consuming task. Instead, hickory nuts were generally pounded into pieces and boiled to extract the oil (Ulmer and Beck 1951). The process of boiling the pounded hickory nuts separates the pieces of shell, which sink to the bottom of the pot, from the oil, which rises to the top as the nutmeats dissolve and can be skimmed off or decanted. This oil or milk would then be used as an added ingredient in soups and stews, as a condiment for vegetables, or as a general sauce or beverage (Scarry 2003; Talalay et al. 1984). Acorn processing depends upon whether the nuts derive from white or red oak trees. Nuts from the red oak are high in tannin and are extremely bitter as a result. White oaks, however, yield sweeter nuts; the nutmeats from these acorns can be used for cooking immediately after extraction from the shell (Scarry 2003). The tannin present in the bitter acorns, however, requires an additional processing step. Leaching the tannin from acorns can be accomplished either by soaking them in water, or parching and then boiling them with an alkaline substance such as wood ash. Once processed, acorns were generally ground into a fine meal, which could then be used to make gruel, bake bread, or thicken stews. Less often, acorns were boiled and the oil extracted (Swanton 1944:260, 277).

Fruit taxa recovered from the samples are represented by a combination of wild and domestic species that include maypop (*Passiflora incarnata)*, peach (*Prunus persica*) and sumac (*Rhus* sp.). The only definitive domesticated fruit identified was peach (*Prunus persica*). The presence of peach, an Old World species, does not necessarily indicate direct contact with Europeans. Rather, this species was probably incorporated into native food systems through traditional exchange networks (Gremillion 1993)[1]. Each of these fruits is edible and would most likely have been eaten raw, incorporated into stews, or dried for later use (Scarry 2003).

Grain/oil seeds identified include sunflower (*Helianthus annuum*.), chenopod (*Chenopodium* sp.) and purslane (*Portulaca* sp.). It is uncertain whether the sunflower seed is wild or domesticated, but wild sunflower seeds could have been gathered and domesticated seeds cultivated simultaneously. Chenopod and purslane seeds were gathered and eaten; their greens were also edible and could have been used as potherbs (Hedrick 1972; Medsger 1966, Ulmer and Beck 1951). Grain seeds were probably parched and could be ground down to a meal and baked into bread or incorporated into

[1] Peach may have also extended its range naturally throughout the southeastern U.S. (Gremillion 1993).

stew. Oil seeds like sunflower could be mixed into bread meal and/or stews (Scarry 2003).

Table 1. Summary of plant taxa for Western Carolina Regional Airport flotation samples

N of Samples	4		
Plant Weight (grams)	37.59		
Wood Weight (grams)	36.54		
Common Name	*Taxonomic Name*	Count (n)	Weight (g)
Cultigens			
Bean	*Phaseolus vulgaris*	10	0.08
Bean cf.	*Phaseolus* sp.	7	0.05
Corn cupule	*Zea mays*	11	0.08
Corn cupule cf.	*Zea mays*	2	0.02
Corn kernel	*Zea mays*	27	0.2
Corn kernel cf.	*Zea mays*	3	0.02
Squash/gourd rind	*Cucurbita* sp.	1	0
Nuts			
Acorn	*Quercus* sp.	35	0.15
Acorn cf.	*Quercus* sp.	1	0
Acorn meat cf.	*Quercus* sp.	1	0.03
Hickory	*Carya* sp.	10	0.15
Hickory cf.	*Carya* sp.	5	0.03
Fruits			
Maypop	*Passiflora incarnata*	6	0.01
Peach	*Prunus persica*	1	0.07
Sumac	*Rhus* sp.	1	0.01
Grain/Oil Seeds			
Chenopod	*Chenopodium* sp.	5	0
Purslane	*Portulaca* sp.	8	0
Sunflower	*Helianthus annuus*	1	0.02
Wild Legumes			
Bean family	*Fabaceae*	2	0
Unidentified			
Unidentifiable		31	0.13

An assessment of seasonality for these plants indicates the harvesting and collection of resources from May through November (Table 2). Purslane and squash/gourd are available throughout summer into early fall; peach is available early to mid summer; sumac early summer through mid fall. Corn, bean, maypop, sunflower, and chenopod are available mid summer through mid fall. Acorn and hickory are usually harvested throughout fall. The limited number of samples prevents us from drawing detailed conclusions or conducting any quantitative analysis about plant use at the Western Carolina Regional Airport site. However, the presence of cultigens, nutshell, fruit seeds and grain/oil seeds indicate potential collection and processing of these documented food sources.

Table 2. Seasonality of Western Carolina Regional Airport plant taxa in ascending order by bloom

Common Name	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Purslane					X	X	X	X	X			
Squash/gourd					X	X	X	X	X			
Peach						X	X					
Sumac						X	X	X	X	X		
Corn							X	X	X			
Common bean							X	X	X	X		
Maypop							X	X	X	X		
Sunflower							X	X	X	X		
Chenopod							X	X	X	X	X	
Acorn									X	X	X	
Hickory										X		

Appendix A

Here we discuss the basic results of one flotation sample from feature 11 of site 31CE70, representing 28 liters of soil and a plant weight of 395.54 grams. This sample yielded 8 plant taxa (identified to the Genus level).

Squash/bottle gourd rind (*Cucurbita* sp) was the only definitive field cultigen present in the sample. Bottle gourd fruit, seeds, oil and leaves are edible and the gourds are easy to grow. The rinds can also be hollowed out for storage of water and other substances.

Hickory (*Carya* sp.) and possible acorn (*Quercus* sp.) were the only nuts recovered from the flotation samples, consisting entirely of nutshell remains with the exception of a possible acorn meat fragment. Hickory nuts and some acorns require extensive processing before they are rendered palatable (Petruso and Wickens 1984). The hickory kernels are so tightly enmeshed in the interior shell that picking the nutshells from the cracked shell casing is a time-consuming task. Instead, hickory nuts were generally pounded into pieces and boiled to extract the oil (Ulmer and Beck 1951). The process of boiling the pounded hickory nuts separates the pieces of shell, which sink to the bottom of the pot, from the oil, which rises to the top as the nutmeats dissolve and can be skimmed off or decanted. This oil or milk would then be used as an added ingredient in soups and stews, as a condiment for vegetables, or as a general sauce or beverage (Scarry 2003; Talalay et al. 1984). Acorn processing depends upon whether the nuts derive from white or red oak trees. Nuts from the red oak are high in tannin and are extremely bitter as a result. White oaks, however, yield sweeter nuts; the nutmeats from these acorns can be used for cooking immediately after extraction from the shell (Scarry 2003). The tannin present in the bitter acorns, however, requires an additional processing step. Leaching the tannin from acorns can be accomplished either by soaking them in water, or parching and then boiling them with an alkaline substance such as wood ash. Once processed, acorns were generally ground into a fine meal, which could then be used to make gruel, bake bread, or thicken stews. Less often, acorns were boiled and the oil extracted (Swanton 1944:260, 277).

Blueberry (*Vaccinium* sp.), wild grape (*Vitis* sp.) and possible persimmon (*Diospyros virginiana*) were the only fruit seeds recovered, all of which are edible.

Grain, oil and greens seeds identified include amaranth (*Amaranthus* sp.), chenopod (*Chenopodium* sp.) and purslane (*Portulaca* sp.). All could have been gathered and eaten; their greens were also edible and could have been used as potherbs (Hedrick 1972; Medsger 1966, Ulmer and Beck 1951). Grain seeds were probably parched and could be ground down to a meal and baked into bread or incorporated into stew. Oil seeds like sunflower could be mixed into bread meal and/or stews (Scarry 2003).

Other seeds recovered that may represent incidental inclusions include bedstraw (*Galium* sp.), possible sage (*Salvia* sp.), possible wax myrtle (*Myrica* sp.), and seeds from the grass and sunflower families.

Table 3. Summary of plant taxa for 31CE70 flotation sample

N of Samples	1		
Plant Weight (grams)	395.54		
Wood Weight (grams)	364.96		
Common Name	*Taxonomic Name*	Count (n)	Weight (g)
Cultigens			
Squash/gourd rind	*Cucurbita/Lagenaria* sp.	28	0.24
Nuts			
Acorn cf.	*Quercus* sp. cf.	10	0.1
Acorn meat cf.	*Quercus* sp. cf.	10	0.1
Hickory	*Carya* sp.	2811	29.53
Fruits			
Blueberry	*Vaccinium* sp.	4	0
Persimmon cf.	*Diospyros virginiana* cf.	10	0
Wild grape	*Vitis* sp.	12	0.04
Grain / Oil Seeds			
Amaranth	*Amaranthus* sp.	4	0
Chenopod	*Chenopodium* sp.	4	0
Purslane	*Portulaca* sp.	4	0
Other Seeds			
Bedstraw	*Galium* sp.	4	0
Grass family cf.	*Poaceae* cf.	10	0
Sage cf.	*Salvia* sp. cf.	4	0
Sunflower family	*Asteraceae*	4	0
Wax myrtle cf.	*Myrica* sp. cf.	4	0
Unidentified			
Unidentifiable		130	0.45
Unidentifiable seed		4	0

Table 4. Seasonality of 31CE70 plant taxa in ascending order by bloom

Common Name	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Wax myrtle cf.				X	X	X	X	X	X	X		
Bedstraw					X	X	X	X				
Blueberry					X	X	X	X				
Purslane					X	X	X	X	X			
Squash/gourd					X	X	X	X	X			
Amaranth							X	X	X			
Chenopod							X	X	X	X	X	
Sage cf.								X	X			
Wild grape								X	X	X		
Persimmon cf.									X	X		
Acorn cf.									X	X	X	
Hickory										X		

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